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Description

The present invention relates to a transfusion pump such as a peristaltic pump or roller pump to pump fluids such as liquid medicine. More particularly the invention relates to a transfusion pump having a house body, a pivotable door, a tube pressing means, a plate-like receiving member, a door locking member and a tube clamping device, as disclosed in GB-A-2 225 065 which forms a basis for the precharacterising part of claim 1.

A conventional transfusion pump disclosed in Japanese Patent Application Laid-open-No. 56-113084 comprises a housing body, a door supported on the housing body for pivotal movement between an open position and a closed position, a tube pressing means disposed in the housing body, a platen disposed on the door so as to support a tube against the tube pressing motion of the tube pressing means when the door is closed, and a door locking member for retaining the state of the door closed to the housing body.

In this transfusion pump, an elastic tube is intermittently collapsed between the platen and the tube pressing means by means of the same tube pressing means, whereby a liquid in the tube is displaced and transported, while the tube is allowed to restore in elasticity when relieved from the pressing force applied thereon so as to expand the liquid passage, thus performing a pumping action.

By the way, a transfusion pump is used for the porpose of accurately feeding a small amount of transfusion liquid to the body of a patient, thereby ensuring the safty of the patient. Thus, it must be strictly prevented that the transfusion liquid is allowed to flow under no control, this is to create its free flow, when the transfusion pump is used.

In the conventional transfusion pump, accordingly, there is used such a tube clamp device as shown in Fig. 9. The conventional tube clamp device comprises a tube receiving member 2 disposed on a housing body 1, a clamping member 3 disposed for rotation about a fulcrum 3A provided on the housing body 1, which can clamp a tube 4 between the tube receiving member 2 and the clamping member 3, an urging member 5 for urging the clamping member 3 toward the tube receiving member 2, an unclamp retaining lever 6 disposed on the housing body 1, which can retain the clamping member 3 in an unclamping position where the tube 4 is unclamped, an unclamp retaining portion 8 provided on a door 7, and a pin 9 inserted in a supporting hole 9A provided in the housing body 1, which is pushed by the unclamp retaining portion 8 of the door 7 when the door 7 is closed so as to retain the clamping member 3 in the unclamp position where the tube 4 is unclamped. In addition, the clamping member 3 is provided with an adjusting screw 3B at its part colliding with the pin 9, and an urging member 6A is disposed between the housing body 1 and the unclamp retaining lever 6, which causes the unclamp retaining lever 6 to leave from a position where it is engaged with the clamping member 3.

The tube clamping device which has the aforementioned constitution will be operated as described in the following items (1) to (3).

(1) When the door 7 is opened to set a tube 4, the unclamp retaining lever 6 is pushed to set the clamping member 3 at the unclamp position. In this state, the unclamp retaining lever 6 is rotated about the fulcrum 6B to engage its end with the concave part of the clamping member 3 so that the clamping member 3 is retained in the unclamp position.

(2) When a tube 4 is set and the door 7 is closed to start up a transfusion of liquid, the unclamp retaining member 8 of the door 7 pushes the pin 9 and this pin 9 further collides with the adjusting screw 3B of the clamping member 3 so that the clamping member 3 is opened to an unclamping direction.

After the clamping member 3 is further opened to the unclamping direction, the end of the unclamp retaining lever 6 and the concave part of the clamping member 3 are disengaged so that the unclamp retaining lever 6 is returned to a position where it is not engaged with the clamping member 3 by means of the urging member 6A.

So far as the door 7 is continuously kept closed in this state, the clamping member 3 collides with the pin 9 so as to be continuously retained in the unclamp position, whereby the transfusion pump imparts the pumping action to the tube kept in the unclamp state, thus carrying out the transfusion of liquid.

(3) When the transfusing operation is finished and the door 7 is opened, the pin 9 which is being pushed by the unclamp retaining portion 8 of the door 7 is released to a free situation, whereby the clamping member 3 which has already disengaged with the unclamp retaining lever 6 clamps the tube 4 between the tube receiving member 2 and the clamping member 3 by virtue of the urging member 5, thus preventing the free flow of a transfusion liquid.

In this prior art, however, there are the following problems.

Movable members provided in the housing body 1 include the clamping member 3, unclamp retaining lever 6, pin 9 and other parts. The tube clamp device may, therefore, function improperly, with its maintenance required, because of the wear of these parts with the lapse of time and the deposition of any chemical liquid on the supporting

hole 9A for the pin 9.

The position of the pin 9 which pushes the clamping member 3 when the door 7 is closed (the point where the clamping member 3 and the pin 9 collide with each other) is near to the fulcrum 3A of the clamping member 3. The force of the unclamp retaining portion 8 of the door 7 pushing the pin 9, which overcomes the urging member 5 to press the clamping member 3 to the unclamping direction is therefore very large, and this force may be attributable to bend the whole of the transfusion pump so that the transfusion pump in whole may function improperly.

A similarly constructed pump suitable for medical applications is disclosed in GB-A-2 225 065 and has a house body, a pivotable door, a tube pressing means, a Plate-like receiving member, a door locking member and a tube Clamping device. Similar problems as above may arise with operation thereof.

Starting from such known construction, the present invention is intended to make compact the constitution of a tube clamp device when the tube clamp device is installed in a transfusion pump in order that a transfusion liquid is prevented from freely flowing therein, to prevent the the tube clamp device from functioning improperly, and further to prevent the transfusion pump in whole from functioning improperly.

As claimed the transfusion pump of the invention comprises a housing body, a door supported on the housing body for pivotal movement between an open position and a close position, a tube pressing means disposed in the housing body. A plate-like receiving member is disposed on the door so as to support a tube against the tube pressing motion of the tube pressing means when the door is closed. A door locking member is provided for retaining the state of the door closed to the housing body. A tube clamp device which is further provided can unclamp the tube when the door is opened to set the tube, keep the tube continuously unclamped when the door is closed after the tube has been set, and clamp the tube when the door is opened after its closing. According to the invention the tube clamping device has a tube receiving member disposed on the housing body. A clamping member is disposed for movement on the housing body, which movement can clamp the tube between the tube receiving member and the clamping member. An urging member for urging the clamping member toward the tube receiving member, a first unclamp retaining portion is disposed on the housing body, which can retain the clamping member in an unclamp position where the tube is unclamped when the door is open, an unclamp releasing portion disposed on the door, which collides with the projecting end of the clamping member on the door side when the door is closed, thereby releasing the engagement of the clamping member with the first unclamp retaining portion, and a second unclamp retaining portion disposed on the door, which collides with the projecting portion of the clamping member on the door side, whose engagement with the first unclamp retaining portion has been released by the unclamp releasing portion when the door is closed, thereby retaining the clamping member in engagement therewith so that the clamping member is continuously kept to be retained in the unclamp position where the tube is unclamped. When the door is opened to set the tube, the clamping member is brought in engagement with the first unclamp retaining portion by manual operation so as to be set at the unclamp position. When the door is closed after the tube has been set, the clamping member is released from its engagement with the first unclamp retaining portion by the unclamp releasing portion, and brought in engagement with the second unclamp retaining portion so as to be set at the unclamp position When the door is opened after its closing, the clamping member loses its engagement with the second unclamp retaining portion so as to be set at the clamp position.

In a further embodiement of the invention the clamping member is adapted to be urged to such a direction that it is engaged with the first unclamp retaining portion when the clamping member is moved from the clamping position to the unclamping direction by manual operation.

According to a first aspect of the present invention, there is provided a transfusion pump comprising a housing body, a door supported on the housing body for pivotal movement between an open position and a closed position, a tube pressing means disposed in the housing body, a plate-like receiving member disposed on the door so as to support a tube against the tube pressing motion of the tube pressing means when the door is closed, a door locking member for retaining the state of the door closed to the housing body, and a tube clamping device which can unclamp the tube when the door is opened to set the tube, keep the tube continuously unclamped when the door is closed after the tube has been set, and clamp the tube when the door is opened after its closing, characterized in that the tube clamping device has a tube receiving member disposed on the housing body, a clamping member disposed for movement on the housing body, which can clamp the tube between the tube receiving member and the clamping member, an urging member for urging the clamping member toward the tube receiving member, a first unclamp retaining portion disposed on the housing body, which can retain the clamp-

ing member at an unclamp position where the tube is unclamped when the door is opened, an unclamp releasing portion disposed on the door, which collides with the projecting end of the clamping member on the door side when the door is closed, thereby releasing the engagement of the clamping member with the first unclamp retaining portion, and a second unclamp retaining portion disposed on the door, which collides with the projecting portion of the clamping member on the door side, whose engagement with the first unclamp retaining portion has been released by the unclamp releasing portion when the door is closed, thereby retaining the clamping member in engagement therewith so that the clamping member is continuously kept to be retained in the unclamp position where the tube is unclamped, wherein when the door is opened to set the tube, the clamping member is brought in engagement with the first unclamp retaining portion by manual operation so as to be set at the unclamp position, when the door is closed after the tube has been set, the clamping member is released from its engagement with the first unclamp retaining portion by the unclamp releasing portion, and brought in engagement with the second unclamp retaining portion so as to be set at the unclamp position, and when the door is opened after its closing, the clamping member loses its engagement with the second unclamp retaining portion so as to be set at the clamp position.

According to a second aspect of the present invenion, there is provided a transfusion pump in which the clamping member is adapted to be urged to such a direction that it is engaged with the first unclamp retaining portion when the clamping member is moved from the clamping position to the unclamping direction by manual operation.

The term "clamp" used here means to interrupt the passage of a liquid in a tube by pressing the tube, and "unclamp" means to provide such a state the liquid is permitted to flow by releasing the pressing of the tube.

According to the first aspect of the present invention, there will be obtained the following effects.

The tube clamping device has only the clamping member as any movable members provided in the housing body. It is therefore possible to make compact the constitution of the device with a small number of parts and to prevent any improper function of the tube clamping device which may be caused by the wear of parts with the lapse of time or the deposition of any chemical liquid.

The second unclamp retaining portion which keeps to retain the clamping member in the unclamp position against the urging member when the door is closed, is a part which collides with the projecting end of the clamping member on the door side, and the force of the second unclamp retaining portion which overcomes the urging member to push the clamping member to the unclamping direction is, therefore, relatively small. As a result, it is possible to prevent the transfusion pump in whole from functioning improperly, because this force does not bend the whole of the transfusion pump.

According to the second aspect of the present invention, there will be also obtained the following effect.

The clamping member is imparted with such a habitude that it is engaged with the first unclamp retaining portion when operated by hand. It is therefore possible to make compact the constitution of the device, without injuring its operability.

The invention will be further elucidated by the following description of an embodiment of the invention and the drawings. In the drawings:
Fig. 1 is a schematic view showing a peristaltic pump as one embodiment of the present invention, Fig. 2 is a schematic view showing a tube clamping device of the present invention, Fig. 3 is a schematic view of Fig. 2 taken along a line III-III, Fig. 4 is a schematic view of Fig. 2 taken along a line IV-IV, Fig. 5 is a schematic view showing the tube clamping device when a door is closed, Fig. 6(A) and (B) each is a transverse cross-sectional view showing the peristaltic pump, Fig. 7 is a vertical cross-sectional view showing the peristaltic pump, Fig. 8 is an exploded perspective view showing a critical portion of the peristaltic pump, and Fig. 9 is a tube clamping device of the convential peristaltic pump.

Referring to Fig. 1 and Figs. 6 to 8, a peristaltic pump 10 has a housing 11 and a door 13 supported on the housing 11 through a door shaft 12 for pivotal movement between an open position and a closed position. The door 13 is provided with a knob 14 which can be rotated to lock and unlock the door 13 in the closed position.

The pump 10 is capable of effecting a pumping action on an intermediate portion of a tube 18 which is connected to a liquid guide needle 17 piercing a stop cock 16 of a transfusion vessel 15 shown in Fig. 1, so as to transfuse a liquid from the transfusion vessel 15 into the body of a patient. Numeral 19 denotes a ventilation needle.

As shown in Figs. 6 to 8, the pump 10 has a supporting member 22 carried on a bracket 11A fixed to the housing 11 through a pivot shaft 21. The supporting member 22 is supported for rotation about the pivot shaft 21 and it will be fixed on the bracket 11A at a predetermined rotative position about the pivot shaft 21 by a fixing screw 22A. The fixing screw 22A enables the supporting member 22 to be adjustable in its fixed position so that

when each of eccentric cams 25 mentioned below actuates a finger group 26A toward the plate-like receiving member 23, each finger 26 is set at a collapse position where the tube is properly collapsed.

On the other hand, the door 13 of the pump 10 comprises a combination of a cover plate 13A and a back plate 13B, and the back plate 13B has a plate-like receiving member 23 fixed thereon.

The supporting member 22 has a cam shaft 24 arranged in parallel to the pivot shaft 21, wherein a plurality of cams 25 are incorporated in the longitudinal direction of this cam shaft 24 so as to be fixedly provided thereon, and a plurality of fingers 26 are incorporated, each of which is rockable about the pivot shaft 21 and pressed by each cam 25.

In this state, each finger 26 is adapted to be actuated by a corresponding eccentric cam 25 between a retracted position and an operative position. When the door 13 is closed, the plate-like receiving member 23 can be located so as to oppose the group of fingers 26A, thereby carrying the tube 18 which is disposed between the plate-like receiving member 23 and the finger 26. The fingers are successively set to the operative position by the operation of the successive eccentric cams 25 so that the position where the tube 18 is collapsed by the fingers is progressively moved in the longitudinal direction of the tube. It is to be noted that the tube is normally closed by at least one finger 26. The arrangement is such that, when one of the fingers 26 has commenced its backward movement beyond the maximum collapse position, the next finger keeps the tube in a pressed condition so as to keep the internal liquid passage of the tube 18 closed until the above mentioned finger 26 travels a distance larger enough to open the portion of the internal liquid passage under this finger 26.

The knob 14 of the pump 10 enables to keep the state of the door 13 closed to the housing 11, because it is composed as mentioned below. Namely, the knob 14 which has a knob shaft 14A running through holes 13C and 13D provided in the cover plate 13A and back plate 13B of the door 13, is fitted in the door 13 by a snap ring 14B provided on an intermediate portion of the knob shaft 14A projecting from the back plate 13B, and it has an engaging pin 14C provided at the projecting end of the knob shaft 14A. On the other hand, the bracket 11A of the housing 11 has a hole 11B, into which the knob shaft 14A of the knob 14 is permitted to enter when the door 13 is closed, and an engagement part 11C provided deep in the hole 11B, with which the engaging pin 14C engages. Namely, the knob 14 is adapted to cause the end of the knob shaft 14A to enter into the hole 11B when the door 13 is closed as shown in Fig. 6(B) from the open position of Fig. 6(A), and then to cause the engaging pin 14C to engage with the engagement part 11C by the rotation of the knob shaft 14A, thereby retaining the door 13 in the closed position. In addition, the engagement part 11C has an inclined cam-shaped engagement surface which engages with the engaging pin 14C so that the knob shaft 14A is drawn to the housing 11 with the rotation of the knob shaft 14A.

The knob 14 further has a coil spring 27 provided between the door 13 and the knob 14. Namely, the coil spring 27 is disposed about the knob shaft 14A and fitted between a snap ring 28 provided on an intermediate portion of the knob shaft 14A and the back plate 13B of the door 13.

When the knob 14 retains the door 13 in the closed position to the housing 11, the knob 14 is engaged with the bracket 11A of the housing 11, without moving to the closing direction, so that the door 13 can be relatively moved in the opening direction to the knob 14 and housing 11, assuming that the coil spring 27 is deformed by compression. Namely, the coil spring 27 imparts an urging force in the closing direction to the door 13 under the state that the door 13 is retained in the closed position by the knob 14, and allows the door 13 to move in the opening direction when the pressing force of the finger 26 which is given to the plate-like reveiving member 23 by way of the tube 18 exceeds the aforesaid urging force.

The pump 10 also has a drive motor 31 fixed to the supporting member 22 and having an output shaft carrying a worm gear 32 meshing with a worm wheel 33 which is fixed to one end of the cam shaft 24.

The arrangement is such that the cam shaft 24 is rotatingly driven by the drive motor 31 so as to rotate the eccentric cam 25 thereby activating successive fingers 26, whereby a pumping action is performed as explained before.

The peristaltic pump 10 of the present invention has a tube guide device as will be understood from the following description.

Namely, as shown in Fig. 8, each bracket 11A on the housing 11 has a pressing window 41 and a plate-like guide member 42 for closing the pressing window 41. The guide member 42 is fastened to the bracket 11A by means of screws 44 through a frame member 43 which presses the outer peripheral portion of the guide member 42. As will be seen from Figs. 6(A) and 6(B), the guide member 42 is provided with a tube guide groove 45 formed in the surface thereof wich faces the plate-like receiving member 23 when the door 13 is locked in the closed position on the housing 11 so as to set the tube 18. The guide member 42 is made of a soft elastic material so as not to impede the col-

lapsing action of the finger 26 when the successive fingers are set to the operative position for collapsing the tube 18. Therefore, the tube 18 is received in and guided by the guide groove 45 of the guide member 42 so as to be correctly set without winding, in such a manner that successive tube sections of a predetermined length are correctly located in the pressing regions of the successive fingers. Consequently, the tube is stably collapsed by the successive fingers as these fingers are set to the operative position, whereby a higher precision of control of the liquid flow rate can be obtained.

As shown in Figs 1 to 5, the peristaltic pump 10 has a tube clamping device 50.

Namely, the tube clamping device 50 has, under the guide member 42 on the housing 11, a tube receiving member 51 disposed 50 as to run along one side of the tube 18 which is fitted in the guide groove 45 and suspended therefrom and a clamping member 53 rockably contained in the housing 11, which can clamp the tube 18 between its end projected from the window portion 52 provided on the housing 11 and the tube receiving member 51.

The clamping member 53 is supported in the inside of the housing 11 so as to be rockable about a screw shaft 55 inserted in a fixing plate 54 provided on the housing 11. In this state, the clamping member 53 has a substantially half circumference of its base end about the screw shaft 55 which is provided as an inclined portion 56, and the base end including the inclined portion 56 is adapted to be held between a washer 58 provided on the screw shaft 55 which is urged upward by the urging member or a spring 57 and the said fixing plate 54. This arrangement is such that the clamping member 53 is given with such a moment as shown by the designation M in Fig. 4 about its base end so as to be urged in such a direction that it is engaged with the first unclamp retaining portion 61 when it is rockingly actuated from the clamping position to the unclamping direction by manual operation, as described in the below.

The tube clamping device 50 has a an urging member or a spring 59 for urging the clamping member 53 toward the tube receiving member 51, which is provided between the housing 11 and a longitudinally intermediate portion of the clamping member 53.

The tube clamping device 50 further has a stepped first unclamp retaining portion 61 disposed on the housing 11, which can be engaged with an intermediate portion of the clamping member 53 to retain the clamping member 53 in the position where the tube 18 is unclamped, when the door 13 is opened. The numeral 61A denotes a portion of the first unclamp retaining portion 61 which is engaged with the clamping member 53.

Furthermore, the tube clamping device 50 has, on a back plate 13B of the door 13, an L-shaped member 62 provided under the plate-like receiving member 23. The L-shaped member 62 is composed of an unclamp releasing portion 63 which is substantially wedge-shaped in cross section as its horizontal portion and a second unclamp retaining portion 64 which is also wedge-shaped in cross section as its vertical portion.

The unclamp releasing portion 63 is adapted to collide with the lower colliding surface 65 of the clamping member 53 at its projecting end on the door side to lift upward the clamping member 53 against the moment M of the said spring 57 when the door 13 is closed, whereby the clamping member 53 is automatically released from its engagement with the first unclamp retaining portion 61.

The second unclamp retaining portion 64 is adapted to collide with the side colliding surface 66 of the clamping member 53 at its projecting end on the door side to retain the clamping member 53 against the said spring 59 in engagement therewith when the door 13 is closed, whereby the clamping member 53 is kept to be retained in the position where the tube 18 is unclamped.

The operation of the peristaltic pump 10 will be described here.

(1) When the door 13 is opened to set a tube 18, the clamping member 53 is rockingly actuated from the clamping position to the unclamping direction by manual operation. In this state, the clamping member 53 is urged to a direction in that it is engaged with the first unclamp retaining portion 61 by the spring 57, and it is easily retained in engagement with the first unclamp retaining portion 61 so as to be set at the unclamp position. Thus, the tube 18 is fitted and set in the guide groove 45 of the guide member 42. In this state, the tube 18 is clamped and locked.

(2) When the door 13 is closed after the tube 18 has been set, the clamping member 53 is lifted up by the unclamp releasing portion 63, interlocking with the closing motion of the door 13, so that its engagement with the first unclamp retaining portion 61 is released, and it is retained in engagement with the second unclamp retaining portion 64 so as to be still set at the unclamp position.

Since the tube 18 is held and locked between the fingers 26 of the peristaltic pump 10 and the plate-like receiving member 23 at that time, it is relieved from its clamping. Thus, the peristaltic pump 10 is brought into the state where its operation can be commenced.

After the operation of the peristaltic pump 10 is commenced, the tube collapsing position

given by the respective fingers 26 which constitute the finger group 26A is caused to progress in the longitudinal direction of the tube 18 by actuating each finger 26 by each cam 25, while the tube 18 is carried on the plate-like receiving member 23 fixed on the door 13. In this pump 10, accordingly, the elastic tube 18 is intermittently collapsed between the plate-like receiving member 23 and the tube pressing means by means of the same tube pressing means, whereby a liquid in the tube is displaced and transported, while the tube is allowed to restore in elasticity when relieved from the pressing force applied thereon so as to expand the liquid passage, thus performing a pumping action. If any finger 26 of the finger group 26A collapses the tube excessively, an extraordinarily large elastic reaction force of the tube 18 pushes back the door 13 in such a direction that it is alienated from the finger 26 against the urging force of the coil spring 27. By virtue of this arrangement, the plate-like receiving member 23 fixed to the door 13 is unburdened in such a direction that it is alienated from the finger 26, this is in a direction reverse to the tube collapsing direction, with the movement of the door 13, thereby absorbing an excessive portion of the tube collapsing force of the finger 26.

(3) When the door 13 is opened after the completion of the transfusing operation, the clamping member 53 loses its engagement with the second unclamp retaining portion 64 so as to be set at the clamp position, interlocking with the opening motion of the door 13. The arrangement is such that the clamping member 53 clamps the tube 18 between the tube receiving member 51 and the clamping member 53, thereby preventing the transfusion liquid from freely flowing.

(4) When the door 13 is closed to carry out the transfusing operation again after the door 13 has been opened in the interruption of the tranfusing operation, the second unclamp retaining portion 64 resets the clamping member 53 interlocking with the closing motion of the door 13 so that it is pushed back to the unclamp position, whereby it becomes possible to carry out the transfusion of liquid.

According to the aforementioned embodiment, there will be obtained the following effects.

The tube clamping device 50 has only the clamping member 53 as any movable members provided on the housing 11. It is therefore possible to make compact the constitution of the device with a small number of parts and to prevent any improper function of the tube clamping device 50 which may be caused by the wear of parts with the lapse of time or the deposition of any chemical-liquid.

The second unclamp retaining portion 64 which keeps to retain the clamping member 53 in the unclamp position against the spring 59 when the door 13 is closed, is a part which collides with the projecting end of the clamping member 53 on the door side, and the force of the second unclamp retaining portion 64 which overcomes the spring 59 to push the clamping member 53 in the unclamping direction is, therefore, relatively small. As a result, it is possible to prevent the transfusion pump 10 in whole from functioning improperly, because this force does not bend the whole of the pump 10.

The clamping member 53 is imparted with such a habitude that it is engaged with the first unclamp retaining portion 61 when operated by hand. It is therefore possible to make compact the constitution of the device, without injuring its operability.

According to the present invention which has been described above, it can be achieved to make compact the constitution of a tube clamping device when the tube clamping device is installed in a transfusion pump in order that a transfusion liquid is prevented from freely flowing therein, to prevent the tube clamping device from functioning improperly, and further to prevent the transfusion pump in whole from functioning improperly.

Claims

1. A transfusion pump (10) comprising a housing body (11), a door (13) supported on the housing body (11) for pivotal movement between an open position and a closed position, a tube pressing means (26,42) disposed in the housing body (11), a plate-like receiving member (23) disposed on the door (13) so as to support a tube (18) against the tube pressing motion of the tube pressing means when the door is closed, a door locking member (14) for retaining the state of the door closed to the housing body, and a tube clamping device (50) which can unclamp the tube when the door is opened to set the tube, keep the tube continuously unclamped when the door is closed after the tube has been set, and clamp the tube when the door is opened after its closing, characterized in that the tube clamping device (50) has a tube receiving member (51) disposed on the housing body (11), a clamping member (53) disposed for movement on the housing body (11), which movement can clamp the tube between the tube receiving member and the clamping member, an urging member (59) for urging the clamping member (53) toward the tube receiving member (51), a first unclamp

retaining portion (61) disposed on the housing body, which can retain the clamping member in an unclamp position where the tube is unclamped when the door is open, an unclamp releasing portion (63) disposed on the door (13), which collides with the projecting end of the clamping member (53) on the door side when the door is closed, thereby releasing the engagement of the clamping member (53) with the first unclamp retaining portion (61), and a second unclamp retaining portion (64) disposed on the door, which collides with the projecting portion of the clamping member on the door side, whose engagement with the first unclamp retaining portion has been released by the unclamp releasing portion when the door is closed, thereby retaining the clamping member (53) in engagement therewith so that the clamping member is continuously kept to be retained in the unclamp position where the tube is unclamped, wherein ① when the door is opened to set the tube, the clamping member (53) is brought in engagement with the first unclamp retaining portion (61) by manual operation so as to be set at the unclamp position, ② when the door is closed after the tube has been set, the clamping member is released from its engagement with the first unclamp retaining portion (61) by the unclamp releasing portion (63), and brought in engagement with the second unclamp retaining portion (64) so as to be set at the unclamp position and ③ when the door is opened after its closing, the clamping member loses its engagement with the second unclamp retaining portion so as to be set at the clamp position.

2. The transfusion pump (10), as set forth in claim 1, in which the clamping member (53) is adapted to be urged to such a direction that it is engaged with the first unclamp retaining portion (61) when the clamping member is moved from the clamping position to the unclamping direction by manual operation.

Patentansprüche

1. Eine Infusionspumpe (10) besteht aus einem Gehäuse (11), einer Tür (13), die am Gehäuse (11) schwenkbar befestigt ist und zwischen Offenlage und in Schließlage bewegt werden kann, einem Schlauchdrückteil (26, 42) im Gehäuse (11), einem auf der Tür (13) angebrachten plattenförmigen Aufnahmeteil (23), das einen Schlauch (18) gegen die Schlauchdruckbewegung des Schlauchdrückteils abstützt, wenn die Tür geschlossen ist, einem Türschließteil (14) zur Aufrechterhaltung der Schließlage der Tür zum Gehäuse, sowie einer Schlauchklemmvorrichtung (50), die den Schlauch freigibt, wenn die Tür geöffnet wird, um den Schlauch einzusetzen, die den Schlauch ständig entklemmt hält, wenn die Tür geschlossen wird, nachdem der Schlauch eingesetzt ist, und der Schlauch klemmt, wenn die Tür nach Verschluß geöffnet wird, **dadurch gekennzeichnet,** daß die Schlauchklemmvorrichtung (50) einen Schlauchaufnahmeteil (51) auf dem Gehäuse (11) aufweist, einen Klemmteil (53), der auf dem Gehäuse (11) beweglich angeordnet ist, durch dessen Bewegung die Klemmung des Schlauches zwischen Schlauchaufnahmeteil und Klemmteil erreicht werden kann, ein Federelement (59) zur Verschiebung des Klemmteils (53) in Richtung Schlauchaufnahmeteil (51), einen ersten Entklemmhalteteil (61) am Gehäuse, der den Klemmteil in Entklemmlage halten kann, bei der der Schlauch bei geöffneter Tür entklemmt ist, einen Entklemmfreigabeteil (63) auf der Tür (13), der auf das vorstehende Ende des Klemmteils (53) auf der Türseite aufstößt, wenn die Tür geschlossen wird, dabei den Eingriff des Klemmteils (53) mit dem ersten Entklemmhalteteil (61) freigibt und einen zweiten Entklemmhalteteil (64) auf der Tür, der auf den vorstehenden Teil des Klemmteils auf der Türseite aufstößt,
dessen Eingriff zum ersten Entklemmhalteteil durch den Entklemmfreigabeteil beim Schließen der Tür gelöst worden ist, wodurch das Klemmteil (53) im Eingriff gehalten wurde, so daß der Klemmteil ständig in Entklemmlage gehalten und der Schlauch entklemmt ist, wonach [1] beim Öffnen der Tür zum Einsetzen des Schlauches der Klemmteil (53) durch Handbetätigung in Eingriff zum ersten Entklemmhalteteil (61) gelangt, so daß Entklemmlage vorliegt, [2] beim Schließen der Tür nach dem Einsetzen des Schlauches der Klemmteil aus dem Eingriff zum ersten Entklemmhalteteil (61) durch den Entklemmfreigabeteil (64) gelöst wird und in Eingriff zum zweiten Entklemmhalteteil (63) gelangt, so daß er in Entklemmlage ist, und [3] beim Öffnen der Tür nach deren Verschließen der Klemmteil seinen Eingriff zum zweiten Entklemmhalteteil löst und sich somit in Klemmlage befindet.

2. Infusionspumpe (10) nach Anspruch 1, bei der ein Klemmteil (53) in eine Richtung verschiebbar ist, in der er in Eingriff zum ersten Entklemmhalteteil (61) gelangt, wenn der Klemmteil durch Handbetätigung aus der Klemmlage in die Entklemmrichtung bewegt wird.

Revendications

1. Pompe de transfusion (10) qui comprend un corps formant boîtier (11), une porte (13) montée sur le corps formant boîtier (11) en vue d'un mouvement pivotant entre une position ouverte et une position fermée, un moyen (26, 42) de compression de tube placé dans le corps formant boîtier (11), un élément de réception (23) en forme de plateau placé sur la porte (13) pour soutenir un tube (18) à l'encontre du mouvement de compression dû au moyen de compression de tube lorsque la porte est fermée, un organe de verrouillage (14) de la porte prévu pour maintenir la porte fermée sur le corps formant boîtier et un dispositif (50) de pinçage de tube qui peut relâcher le tube quand la porte est ouverte pour la mise en place du tube, maintenir le tube continuellement non-pincé quand la porte est fermée après la mise en place du tube et pincer le tube quand la porte est rouverte après avoir été fermée,
   caractérisée en ce que le dispositif (50) de pinçage de tube comprend un élément de réception (51) du tube placé sur le corps formant boîtier (11), un organe de pinçage (53) disposé en vue d'un déplacement sur le corps formant boîtier (11), déplacement qui peut pincer le tube entre l'élément de réception du tube et l'organe de pinçage, un organe de poussée (59) destiné à pousser l'organe de pinçage (53) vers l'élément (51) de réception du tube, une première partie (61) de maintien du non-pinçage placée dans le corps formant boîtier, laquelle peut retenir l'organe de pinçage dans la position de non-pinçage pour laquelle le tube n'est pas pincé lorsque la porte est ouverte, une partie (63) de suppression du non-pinçage placée sur la porte (13) qui heurte l'extrémité en saillie de l'organe de pinçage (53) sur le côté de la porte quand la porte est fermée, détachant de ce fait l'organe de pinçage (53) de la première partie (61) de maintien du non-pinçage et une seconde partie (64) de maintien du non-pinçage placée sur la porte qui heurte l'extrémité en saillie de l'organe de pinçage sur le côté de la porte, organe qui a été détaché de la première partie de maintien du non-pinçage par la partie de suppression du non-pinçage quand la porte a été fermée, retenant de ce fait l'organe de pinçage (53) en prise avec elle si bien que l'organe de pinçage est continuellement maintenu dans la position de non-pinçage pour laquelle le tube n'est pas pincé, sachant que:
   1) lorsqu'on ouvre la porte pour mettre en place le tube, l'organe de pinçage (53) est amené en prise avec la première partie (61) de maintien du non-pinçage par actionnement manuel pour se trouver dans la position de non-pinçage,
   2) lorsqu'on ferme la porte après avoir mis le tube en place, l'organe de pinçage est détaché de la première partie (61) de maintien du non-pinçage par la partie (63) de suppression du non-pinçage et est amené en prise avec la seconde partie (64) de maintien du non-pinçage pour se trouver dans la position de non-pinçage, et
   3) lorsqu'on rouvre la porte après l'avoir fermée, l'organe de pinçage est libéré de la seconde partie de maintien du non-pinçage pour se trouver dans la position de pinçage.

2. Pompe de transfusion (10) selon la revendication 1, dans laquelle l'organe de pinçage (53) est propre à être poussé dans une direction telle qu'il se met en prise avec la première partie (61) de maintien du non-pinçage quand il est déplacé de la position de pinçage à la position de non-pinçage par actionnement manuel.

FIG. 1

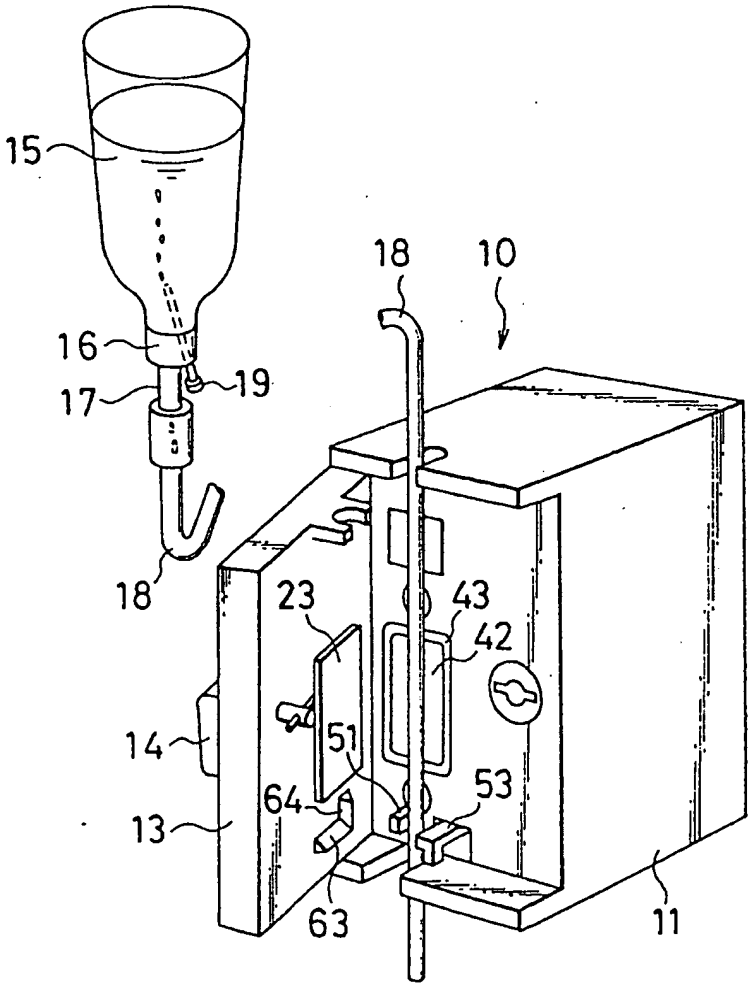


FIG.2

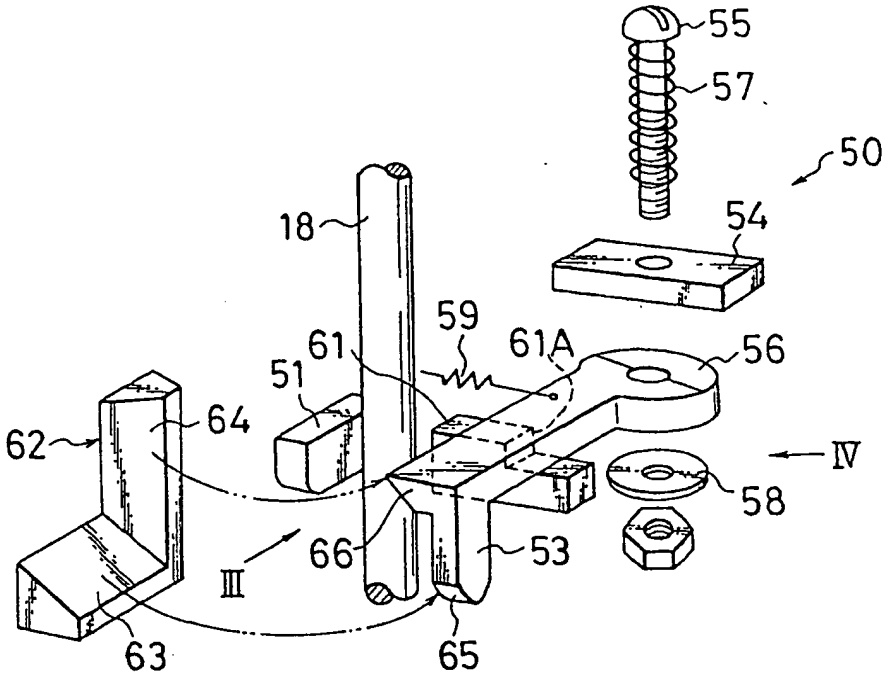


FIG.3

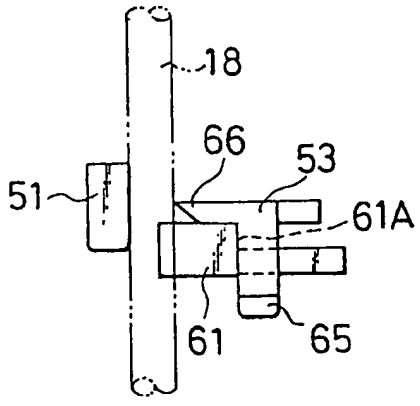


FIG.4

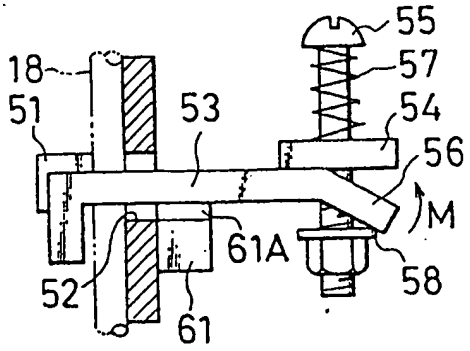


FIG.5

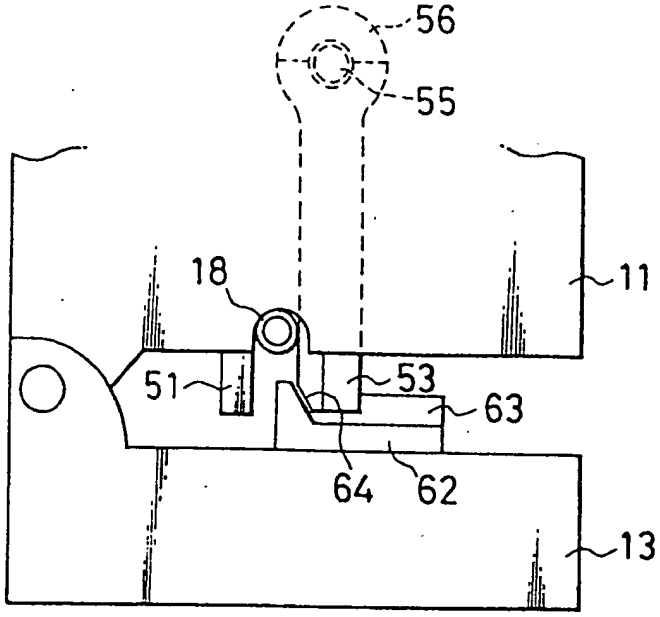


FIG.9

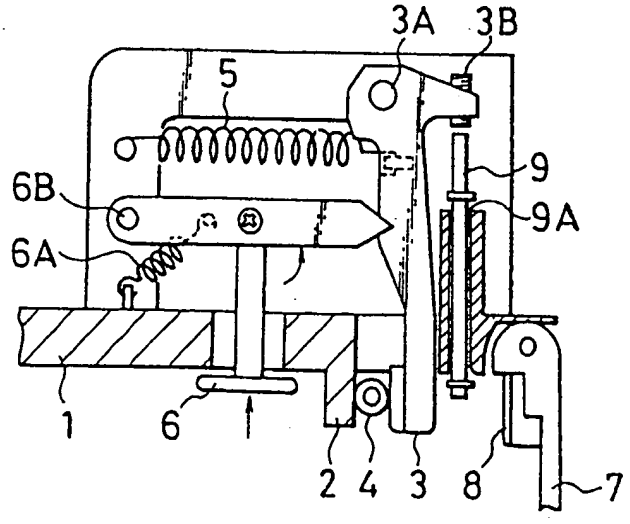
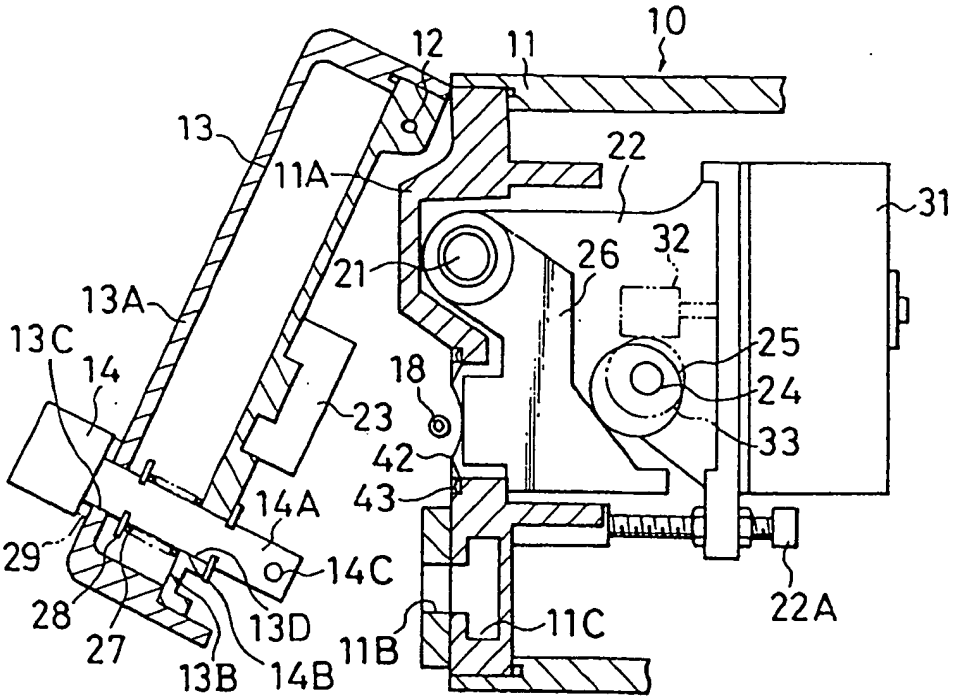


FIG.6A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11
10
13
11A
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31
21
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32
13A
13C
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14A
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14C
28
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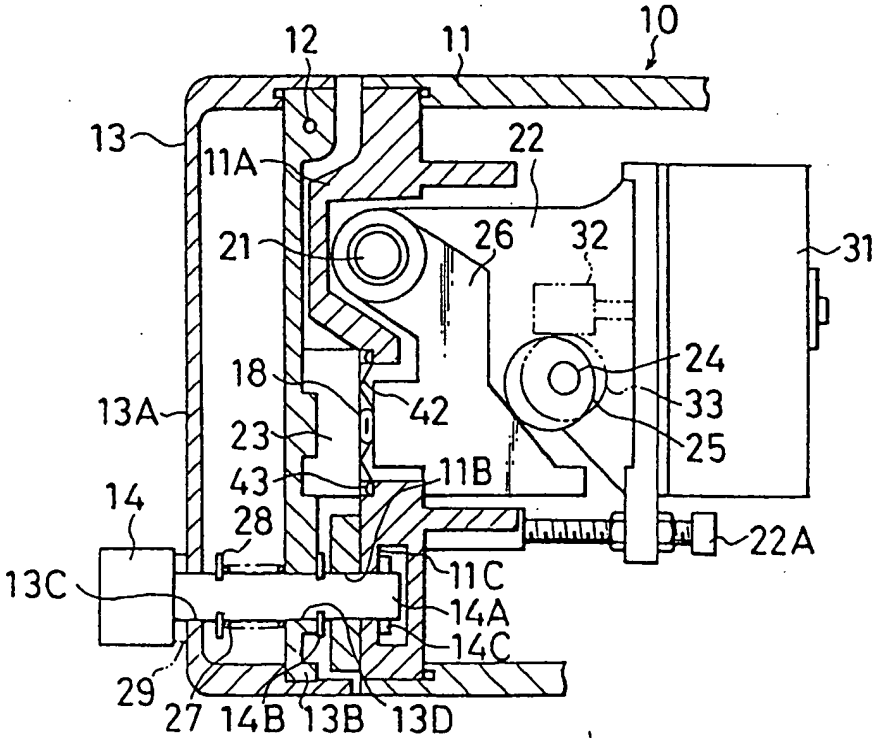
13D
11B
11C
22A
13B
14B

FIG.6B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13B
13D

FIG.7

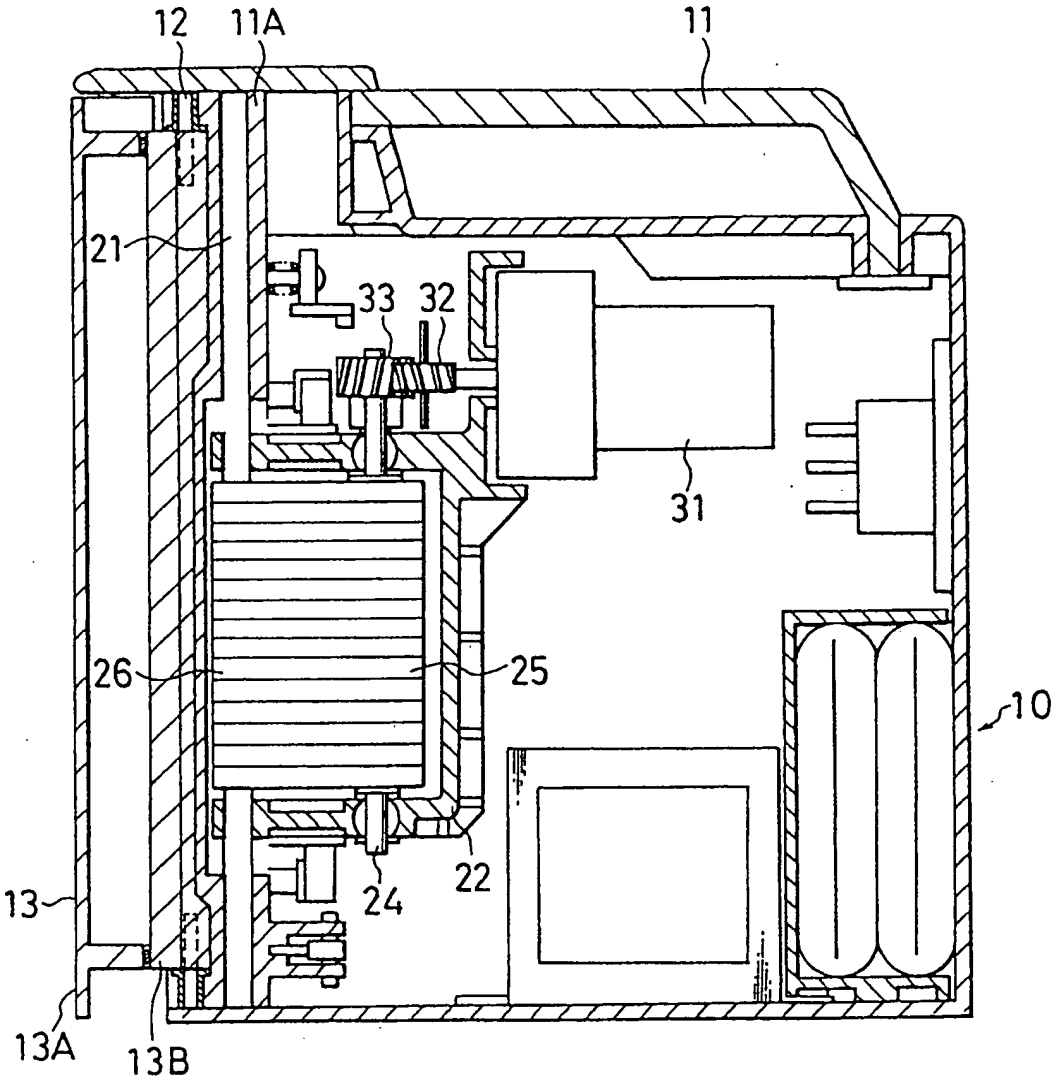

FIG.8